COURSE DESCRIPTION CARD - SYLLABUS

Course name
Basics of erosive machining [N1ZiIP1>POE]

Course

Field of study
Management and Production Engineering

Year/Semester
4/8

Area of study (specialization)
–

Profile of study
general academic

Level of study
first-cycle

Course offered in
Polish

Form of study
part-time

Requirements
elective

Number of hours

Lecture
10

Laboratory classes
8

Other (e.g. online)
0

Tutorials
0

Projects/seminars
0

Number of credit points

3,00

Coordinators

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Lecturers

Prerequisites

1) The student has basic knowledge of physics, mathematics and mechanics. 2) The student is able to use the acquired knowledge to analyze new manufacturing techniques and knows how to use information obtained from the library and the Internet. 3) The student shows independence in solving problems, acquiring and improving the acquired knowledge and skills, understanding the need to learn.

Course objective

Acquainting future engineers with technology of erosive machining and focusing them on acquiring knowledge in the field of new solutions and their evaluation.

Course-related learning outcomes

Knowledge:
1) Has knowledge of erosive machining techniques including the essence and application of individual techniques, tool materials, technological parameters and indicators, and the surface layer.

Skills:
1) Can find information on manufacturing processes in mechanical engineering, integrate the obtained

information, interpret it, as well as draw conclusions and formulate and justify opinions about them.
2) Can develop an opinion on the technology of product manufacturing.
3) Is able to select modern erosion technologies for the implementation of production processes, increase the efficiency of production systems through integration activities.

Social competences:
1) Correctly identifies and resolves dilemmas related to the profession in the scope of the subject covered by the subject.

Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

Lecture: Written exam (in case of answers to: from 50 to 60% of questions - dst, above 60 to 70% - dst +, above 70 to 80% - db, above 80 to 90% - db +, above 90 to 100% - very good) .
Laboratory: Reports on exercises. To obtain credit for the laboratory, the number of absences cannot exceed 1/3 of the classes.

Programme content

1) Differences between machining and erosive machining. Classification of erosive manufacturing techniques.
2) The essence and application of electrodischarge sinking. Technological versions of sinking: coarse and finishing electrode, with orbiting, with additional rotation of the electrode in relation to the object, etc. Parameters and technological indicators of sinking. Electrode materials and their manufacture.
3) The essence and application of wire electrodischarge machining. Technology of cutting internal and external closed and open profiles, 2D surfaces and cones. Parameters and technological indicators of wire EDM. Materials and diameters of wire .
4) The essence and application of electrochemical treatment.
5) Structure, properties and application of individual types of lasers. Technological parameters for laser processing.
6) The essence and application of various methods of jet cutting: laser, plasma, water jet and abrasive water jet, etc. Heads, technological parameters and gases used in cutting.
7) Laser hole drilling: single-pulse, multi-pulse, terpan and spiral. Comparison with other methods of machining holes.
8) The essence of laser and photochemical texturing. Comparison for cost and accuracy of texturing methods.
9) Induction and laser hardening on cutting machines.
10) Methods of erosive deburring and surface cleaning and their comparison with other methods.
11) The essence and application of electron beam processing.
12) hybrid erosion machining (electrochemical abrasive machining, electro erosion and electrochemical machining assisted by ultrasonic, anodic machining, electrochemical milling, erosive mechanical machining with a brush electrode, laser assisted machining etc.)
13) Laser additive processing: claddingg, selective melting and sintering.

Course topics

1) Differences between machining and erosive machining. Classification of erosive manufacturing techniques.
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5) Structure, properties and application of individual types of lasers. Technological parameters for laser processing.
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machining holes.
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13) Laser additive processing: claddingg, selective melting and sintering.

Teaching methods

Lecture: multimedia presentation, discussion.
Laboratory: Practical method of realization of production tasks, instruction, discussion, work with a book.

Bibliography

Basic:
1) Siwczyk M.: Obróbka elektroerozyjna podstawy technologiczne. Tom 1 i 2. Firma Naukowo - Techniczna "Mieczysław Siwczyk" 2000
2) Ruszaj A.: Niekonwencjonalne metody wytwarzania elementów maszyn i narzędzi. Wydawnictwo Instytutu Obróbki Skrawaniem, Kraków 1999
3) Jóźwicki R.: Technika laserowa i jej zastosowania, Oficyna Wydawnicza Politechniki Warszawskiej, Warszawa 2009
4) Oczoś K.: Kształtowanie materiałów skoncentrowanymi strumieniami energii. Wydawnictwo Uczelaniane Politechniki Rezszowskiej, Rzeszów 1988
5) Zimny J.: Laserowa obróbka stali. Wydawnictwo Politechniki Częstochowskiej 1999
6) Mazurkiewicz A.: Konstytuowanie powierzchni i addytywne kształtowanie wyrobów obróbką laserową. Radom 2018
7) Radek N.: Laboratorium wiązkowych technologii obróbki materiałów. Wydawnictwo Politechniki Świętokrzstkiej, Kielce 2013
8) Albiński K., Miernikiewicz A., Ruszaj A., Zimny J.: Laboratorium obróbki erozyjnej. PWN, 1980

Additional:
1) Praca pod redakcją Żebrowskiego H.: Techniki wytwarzania. Obróbka wiórowa, ścierna i erozyjna. Oficyna Wydawnicza Politechniki Wrocławskiej, Wrocław 2004
3) Ion J. C.: Laser Processing of Engineering Materials: Principles, Procedure and Industrial Application. Elsevier Ltd., 2005
4) Hassan El-Hofy: Fundamentals of Machining Processes. Conventional and Nonconventional Processes. CRC Press 2019
5) Figurski J., Popis St.: Wykonywanie elementów maszyn, urządzeń i narzędzi metodą obróbki maszynowej. WSiP, 2015
6) Dokumentacja maszyn technologicznych i programu CAD/CAM: elektrodrążarka Agie Charmilles Cabinet SP1U, laser diodowy TruDiode 3006 firmy Trumpf, wycinarka drutowa ACCUTEX AL400SA, program CAD/CAM Esprit Platinum

Breakdown of average student's workload

	Hours	ECTS
Total workload	75	3,00
Classes requiring direct contact with the teacher	35	1,50
Student's own work (literature studies, preparation for laboratory classes/ tutorials, preparation for tests/exam, project preparation)	40	1,50